REMARKS

This is filed in response to the non-final Office Action mailed October 20, 2005.

Objection to Claims 6 and 27

In the Office Action, Claims 6 and 27 were objected to because of typographical errors. In response, applicant has amended these claims to correct the errors.

Rejection under 35 U.S.C. § 112, Second paragraph

Claim 15 was rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for including the language "the other elements of the fiber optic readhead arrangement". Specifically, the Examiner questioned what would constitute "these other elements." In response, applicant has amended Claim 15, as above, to delete the objected-to language "the other elements."

Rejection under 35 U.S.C. § 102(b)

In the Office Action, Claims 1, 6, 18-21, and 26-27 were rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 4,733,071 to Tokunaga. Applicant respectfully traverses the rejection of these claims and submits the following.

Of the rejected claims, Claim 1 is the only independent claim. Claim 1 (as amended) explicitly recites a device for measuring the relative displacement between two members, including "a fiber optic readhead arrangement" positionable relative to a "scale grating pattern" to provide "an operable interference illumination field arising from light diffracted by the scale grating pattern." (Emphasis added.) The description of "diffraction" and the "interference illumination field" as used in the present application can be found, for example, at page 10 of the Specification as filed, quoted below:

> [Referring to FIGURE 2, it] should be appreciated that the scale light axes 255A and 255B correspond to the *diffraction* of the central ray of the source light 250. Thus, the central scale light axes 255A and 255B follow the first order *diffraction*

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> angles.... Each of the +1 and –1 *diffraction* order scale lights 254A and 254B, respectively, continue to diverge about the scale light axes 255A and 255B to provide illumination zones 254A' and 254B' as indicated by the dashed circles.... The illumination zones 254A' and 254B' of the scale light 254A and 254B intersect to provide an *interference* zone 256' including *interference* fringes 266.... It is convenient to describe the cross-section of the *interference* zone 256' as defining *an interference illumination field* 256 at the plane corresponding to the receiver gap 285.
>
> (Page 10, lines 1-16, emphasis added.)

Applicant has thoroughly reviewed Tokunaga and submits that it does not disclose or suggest a fiber optic readhead arrangement that is operable to provide an "interference illumination field arising from light diffracted by the scale grating pattern." (Emphasis added.) Specifically, while the Office appears to equate the claimed "grating" of the present application with the combination in Tokunaga of "a reflection portion α" that reflects a detection light and "a reflection portion β" that absorbs the detection light (Col. 3, lines 12-23), the combination of reflection portions α and β in Tokunaga does not cause any diffraction of light, and hence does not provide any interference illumination field arising from light diffracted by a scale grating pattern. Rather, the combination of reflection portions α and β merely provide simple light reflection, as explained in Tokunaga below:

> [Referring to FIGURES 5 and 6, the] light from the light element through the optical fiber is emitted out of the light emission portion 21, reflected by the outer circumferential surface of the code disk 12, impinges upon the respective light reception portions 22 and 23, and detected as two output signals by the light reception elements respectively connected to the light reception portions through the corresponding optical fibers.... Accordingly, in the case where the reflective portion α and the non-reflective portion β are moved right in the drawing, the light reflected by the reflective portion α impinges upon the light reception portion 22 when the reflective portion α comes in the region Xa and the light reflected by the reflective portion α impinged upon the light reception portion 23 when the reflective portion α comes in the region Xb. On the other hand, when the non-reflective portion β comes in the region Xa or Xb, the light reception portion 22 or 23 receives no light, respectively.
>
> (Col. 4, lines 32-56.)

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As best shown in FIGURE 6, the code disk pitch "P" contemplated in Tokunaga is on the order of the source fiber size "d" or the size of the illumination spot. Such a configuration simply cannot cause light diffraction, which in turn produces interference. In other words, the configuration of FIGURE 6 is geometrically incapable of splitting light from the light emission portion 21 by the use of the code disk 12 and interfering the split light in the vicinity of the receiver fibers 22 or 23. Furthermore, nothing in the specification (text) of Tokunaga teaches or suggests the use of the code disk 12 to produce light diffraction or interference.

Accordingly, Tokunaga does not teach or suggest a device of Claim 1 including "a fiber optic readhead arrangement" positionable relative to a "scale grating pattern" to provide "an operable interference illumination field arising from light diffracted by the scale grating pattern" (emphasis added). Therefore, Claim 1 is allowable over Tokunaga.

Claim 1 is allowable over Tokunaga for the additional reason that Claim 1 explicitly recites its "fiber-optic receiver channel" to include "a respective receiver channel spatial phase mask portion." This element is not only missing in, but in fact is explicitly *excluded* from, Tokunaga. Specifically, Tokunaga, in its *background* section, describes a spatial phase mask ("phase shift plate") 5 of FIGURE 1 used in a conventional encoder, which is *not* an optical-fiber type encoder. (Col. 1, line 23-Col. 2, line 21.) Tokunaga then proposes to *replace* the spatial phase mask 5 of the prior art with "light reception portions" (i.e., optical fibers) 22 and 23 of FIGURES 4-6, while setting the spatial phase between the optical fibers 22 and 23 as shown in FIGURES 7 and 8. (Col. 3, line 10-Col. 6, line 8.) As such, Tokunaga does not disclose or suggest a "fiber-optic receiver channel" that *includes* ("comprises") "a respective receiver channel spatial phase mask portion," as explicitly recited in Claim 1. Thus, Claim 1 is allowable over Tokunaga for this additional reason.

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Furthermore, Claims 6, 18-21, and 26-27, which all ultimately depend from Claim 1, are also believed to be allowable over Tokunaga for at least the same reasons why Claim 1 is allowable.

Judicially Created Obviousness-Type Double Patenting Rejection

In the Office Action, Claims 1-31 were rejected under the judicially created doctrine of obviousness-type double patenting over U.S. Patent No. 6,906,315 to Tobiason ("the '315 patent"). Specifically, independent Claims 1 and 28 of the present application were found to be not patentably distinct from Claims 1 and 41 of the '315 patent, respectively. In response, applicant has amended Claims 1 and 28, as above, to more specifically recite the subject matter that applicant considers as his invention, and to render Claims 1 and 28 patentably distinct from the claims of the '315 patent.

Claims 1 and 28, as amended, recite that "the interference illumination field comprises respective light and dark interference fringe *zones* that extend along a direction approximately *perpendicular to the scale grating pattern*." (Emphasis added.) Support for the amendment can be found, for example, at page 10, lines 10-29 of the Specification. (See, e.g., "The light and interference fringe *zone*s are periodic along the direction parallel to the measuring axis 82 according to an interference fringe period 83, generally indicated herein as the interference fringe period or interference fringe pitch P_{if}" at page 10, lines 23-25, FIGURE 2, emphasis added; "the interference fringe *zones* extend along the direction *perpendicular to the plane of the scale grating* 80" at page 10, lines 26-27, FIGURE 2; emphasis added.)

On the other hand, the '315 patent describes its claimed "self-image" (which the Examiner has suggested as corresponding to an "interference illumination field" of the present application) as comprising *stripes* that are *localized* in planes *parallel to* the scale grating pattern. Specifically, "[t]he self-image 266 is an image consisting of light and dark *stripes*, each extending perpendicular to the measuring axis 82. The light and dark *stripes* are periodic in the

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direction parallel to the measuring axis 82 according to a self-image period 83, generally indicated herein as the self-image period or self-image pitch P_{si}.... In the self-imaging arrangement 200, the self-image plane 226 is *parallel to the plane of the scale grating 80.*" (Col. 5, line 67-Col. 6, line 7, FIGURE 2, emphasis added.)

Accordingly, Claims 1 and 28, as amended, recite the subject matter that is not obvious in view of, and therefore is patentably distinct from, Claims 1 and 41 of the '315 patent. Therefore, applicant respectfully requests that the Office withdraw the obviousness-type double patenting basis for rejecting Claims 1 and 28. Applicant further respectfully requests that the Office withdraw this basis for rejecting Claims 2-27 and 28-31, which depend from amended Claims 1 and 28.

Closing

Based on the foregoing, applicant respectfully requests that the Examiner allow the present application including Claims 1-31, as amended, to mature into a patent. If the Examiner should have any further issues to resolve, she is invited to telephone applicant's undersigned attorney at the number set forth below.

Respectfully submitted,

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